



# Analyzing problems in fish fry marketing: A farm level study in Bangladesh

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## General Note



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## ABSTRACT

Problems are common issue that creates barrier to both fish fry as well as fish production. This study was mainly undertaken to determine and analyze the extent of the problems faced by the hatchery owners in marketing fish fry in ten unions of Muktagacha and Trishal upazila (sub-district) under Mymensingh district. Data were collected from 70 sampled hatchery owners during March-

April, 2019, using a pre-tested structured interview schedule. A four point rating scale was used to determine the extent of problems. The study identified twelve (12) major problems as faced by the hatchery owners in marketing fish fry. The findings indicated that majority of the hatchery owners (95.7%) faced medium problems in marketing fish fry. Among twelve problems 'high cost of labor' got the highest problem facing score (187) and 'mortality of fish fry' got the lowest score (73). Thus, it can be concluded that a great majority of the hatchery owners faced problems in marketing fish fry that indicates the reasons of low marketing and production of fish fry in Bangladesh. Department of Fisheries (DoF) and other related organizations can offer necessary funds and training for the hatchery owners to overcome the problems in marketing fish fry to ensure timely fish production and supply in Bangladesh. Among twelve selected characteristics of the hatchery owners, farm size, hatchery management experience, and total investment at hatchery showed significant negative relationships with problems in fish fry marketing while extension media contact showed positive significant relationship for the same. Using the regression models, the study also identified influential factors i.e. extension media contact and knowledge on hatchery management those affect the hatchery owners' problems in fish fry marketing. Thus, it can also be concluded that these two factors may be considered by the policy makers while taking plan in this regard.

**Keywords:** Problems, Fish fry, Marketing, Department of Fisheries, Bangladesh

## 1. INTRODUCTION

Bangladesh is one of the world's leading fish producing countries with a total production of 42.77 lakh metric ton in the year 2017-18, which is five times more compared to the production in year 1983-84 (DoF, 2018). The rapidly growing aquaculture sector of the country, that contributes 56.24 percent of the total fish production, has been showing an average growth performance of 5.26 percent during the last ten years. If the increasing trend of fish production continues, the projected production target of 45.52 lakh metric ton fishes will be achieved by 2021 (DoF, 2018). Currently, the rapidly expanding sector is playing a significant role in the agrarian economy of the country i.e. 3.65 percent to the national gross domestic product (GDP) and 23.81 percent to the agricultural GDP (DoF, 2017). Aquaculture practice has the potentiality to achieve self-sufficiency in the food sector and to reduce poverty in Bangladesh (Al-Amin *et al.*, 2012). The promising sector supplies major portion (60%) of total animal protein for the growing population as well as engages a large portion of labour force of the country. About 18.5 million people have involved in this sector in which numbers of fish farmers are around 13.86 million. Thus, fish farming activities contribute to improve socioeconomic conditions of a large number of fishers living in rural Bangladesh (Ara, 2005).

The country has huge water resources to obtain substantial fish production from three sources: inland culture, inland capture and marine culture. In addition, cage culture is getting popularity in the potential water-bodies of the country. During recent past decades, rapid development of hatcheries and nurseries; dissemination of improved technology packages; supportive/need-based extension services; and various initiatives of the government have provided ample scope to make the fisheries sector as a promising platform to strengthen the national economy (DoF, 2018). Although the aquaculture sector has been showing a steady and consistent growth performance over time, various concerns have arisen about its long term sustainability in Bangladesh. During the recent past decades, the share of inland capture fisheries has been declined remarkably mainly due to decline and degradation of wetland resources (DoF, 2018). Fish fry production and trading is profitable in the country but lack of sufficient fund, high price of input, lack of marketing facilities, lack of scientific and technical knowledge, lack of quality brood fish, indiscriminate hybridization, inbreeding, water shortage in dry season etc. still remain as challenges for many rural fishers of the country. There is a complex network of fish fry supply which is not institutionally organized, involving hatchery operators, nursery operators, middlemen (seed traders) and fish farmers (Hossain *et al.*, 2015). However, fish fry marketing systems are often disadvantaged due to the poor road and transport facilities, higher transport costs, poor infrastructure of caring capacity, lack of oxygen, lack of storage facilities etc.

The degree and severity of the aforementioned problems largely vary with the geographical position of the water-bodies; infrastructural development of the area; cultured fish species; farmers' socio-economic conditions; etc. Therefore, to identify and analyze context specific problems in fish farming, systematic study findings need to be well documented from different corners of the country where fish farming has already got a momentum. Although existing literature reported various problems and prospects of fish farming activities, these covered only a few dimensions of problems from few fish farmer communities of Bangladesh. Rahman (2013) studied on constraints in production and marketing of fish in West Bengal and Ali *et al.* (2010) studied about the problems and prospects of fish fry trade in Jessore district of Bangladesh. Toufiqul (2017) conducted a study on constraints faced by the fish farmers in culture and marketing of Tilapia. Jesu *et al.* (2008) found that use of plastic bag is one of the most widespread methods for egg, fry and fingerling transportation. Other studies have approached related topics, such as fry marketing system

(Sultan, 2008), tilapia fish fry trading (Ali *et al.*, 2010) and mortality rate of fish seeds (*Labeorohita*) during traditional transportation system (Islam and Hossain, 2013), and the market structure (Shyamal *et al.*, 2016) are available. However, hatchery owners' problems in fish fry marketing in Mymensingh district of Bangladesh remained unexplored by systematic study where various indigenous and exotic fish culture is practiced in an extensive way (Ahmed *et al.*, 2017). Therefore, the researchers aimed to conduct this research in some selected areas of Mymensingh district. The specific objectives of the study were: (i) to describe the selected characteristics of the hatchery owners; (ii) to determine the extent of problems faced by the hatchery owners in marketing fish fry; (iii) to explore the relationships between the selected characteristics of the hatchery owners and problems faced by them; and iv) to identify the factors associated with the problems of the hatchery owners in fish fry marketing.

## 2. METHODOLOGY

The study was conducted in Mymensingh district, North-central Bangladesh where a large number of farmers are engaged in fish culture (Sarker *et al.*, 2014). More importantly, the region is selected purposively because a number of fish hatcheries have been established in the area to meet the demand of fish fries (Ahmed and Garnett, 2011). Five unions namely Basati, Rambhadrapur, Kheruajani, Mankon and Kumarghata of Muktagacha upazila (sub-district) and another five unions namely Balipara, Bailor, Mokshapur, Dhanikhola and Trishal of Trishal upazila (sub-district) under Mymensingh district were selected purposively to conduct the study. These unions of the two upazilas (sub-district) were selected because a considerably high number of hatchery owners of these areas are involved in fish fry marketing.

According to the data of the upazila (sub-district) fisheries officers of Muktagacha and Trishal upazila (sub-district) the total number of hatchery in these two upazila were 140 that constituted the population of the study. A total of 70 hatcheries (50% of the total population) were selected randomly as the sample of the study. Data were collected from 70 hatchery owners during March-April, 2019 through face to face interview by using a pre-tested structured interview schedule. Extent of problems faced by the hatchery owners in fish fry marketing was the focus variable and twelve selected characteristics of the hatchery owners were selected as explanatory variables namely age, level of education, family size, farm size, annual income, access to credit, hatchery management experience, total investment at hatchery, training at hatchery management, extension media contact, organizational participation and knowledge on hatchery management.

During secondary data collection from the relevant offices of the two upazilas (about the number and list of hatchery owners), informal discussion with the field level extension officers helped making a list of hatchery owners' problems in fish fry marketing. These problems were listed in the structured interview schedule which was used to conduct pre-test interviews. Later, the hatchery owners' responses during the pre-test interviews provided additional practical insights about their problems in fish fry marketing in the area. Thus the study process helped identifying 12 major problems as faced by the hatchery owners in marketing fish fry which was used in the final interview schedule for further data gathering and analysis. Each hatchery owner was asked to indicate the extent of problem using a 4-point rating scale as high, medium, low and not at all and weights were assigned to these responses as 3, 2, 1 and 0, respectively (Islam *et al.*, 2013). The problem facing score was obtained by adding weights of responses of the problems and therefore, the problem facing score could vary from 0 to 36, where 36 indicates a severe problem and 0 indicates no problem in fish fry marketing by the hatchery owners. A rank order of the problems was prepared. For making rank order, problem facing score (PFS) (Rahman, 2014; Pandit and Basak, 2013) was calculated by using the following formula to identify the critical problems in the study area.

$$PFS = (P_h \times 3) + (P_m \times 2) + (P_l \times 1) + (P_n \times 0) \dots \dots \dots (i)$$

Where,

PFS = Problem Facing Score,

$P_h$  = Number of respondents with high problems,

$P_m$  = Number of respondents with medium problems,

$P_l$  = Number of respondents with low problems and

$P_n$  = Number of respondents with no problem.

Thus, the PFS of individual problem could range from 0 to 210, where 0 indicating no problem and 210 indicating high problem in fish fry marketing by the hatchery owners. The SPSS (version 16) computer program was used for analyzing the data. Different descriptive statistical measures such as frequency, number, percentage, mean, standard deviation and rank order was used for categorization and describing the variables. Karl Pearson's Product Moment Correlation coefficient (r) (Pearson, 1895) was used for

testing the relationship between the concerned variables. Multiple regression analysis (both enter and step-wise method) was used to determine hatchery owners' problems in fish fry marketing.

### 3. RESULTS AND DISCUSSION

#### Socio-economic characteristics of the hatchery owners

In this section, summary of the selected characteristics of the hatchery owners have been presented in Table 1. The findings revealed that more than half of the respondents (51.4%) were middle-aged, followed by young (48.6%). The majority of the respondents (48.6%) had secondary education and more than half of them (55.7%) belong to a large family.

**Table 1** Socio-economic characteristics of the hatchery owners (n = 70)

Characteristics	Score Range		Respondents (n=70)			Mean	SD
	Possible	Observed	Category	No.	%		
Age (Years)	Unknown	25-52	Young (up to 18- 35)	34	48.6	36.43	6.75
			Middle-aged (36-55)	36	51.4		
			Old (above55)	0	0		
Level of education (Year of schooling)	Unknown	1-13	Illiterate (0)	0	0	7.10	3.19
			Primary level (1-5)	26	37.1		
			Secondary level (6-10)	34	48.6		
			Higher secondary (11-12)	9	12.9		
			Above higher secondary (above 12)	1	1.4		
Family size (Number)	Unknown	2-15	Small (2-4)	12	17.1	7.43	2.88
			Medium (5-6)	19	27.2		
			Large (above 6)	39	55.7		
Farm size (Hectare)	Unknown	0.05-34.68	Marginal (0.001-0.19)	7	10.00	2.55	5.47
			Small (0.2-0.99)	25	35.7		
			Medium (1-2.99)	27	38.6		
			Large (3 above)	11	15.7		
Annual income (Taka in "million" BDT)	Unknown	0.20-9.00	Low (up to 0.15)	0	0	2.42	2.01
			Medium (0.151-0.3)	4	5.7		
			High (above 0.3)	66	94.3		
Access to credit (Taka in "million" BDT)	Unknown	0.00-5.00	No credit (0)	31	44.3	0.51	0.85
			Low (up to 0.15)	3	4.3		
			Medium (0.151-0.3)	7	10.00		
			High (above 0.3 )	29	41.4		
Hatchery management experience (Years)	Unknown	1-29	Low ( up to 8)	51	72.8	6.97	4.98
			Medium (9-16)	17	24.3		
			High (above 16)	2	2.9		
Total investment at hatchery (Taka in "million" BDT)	Unknown	0.2-10.00	Low (up to 0.15)	0	0	1.42	2.01
			Medium (0.151-0.3)	17	24.3		
			High (above 0.3)	53	75.7		
Training on hatchery management (Days)	Unknown	0-119	No training (0)	25	35.7	29.01	39.12
			Low (1-10)	19	27.1		
			Medium (11-20)	3	4.3		
			High (above 20 )	23	32.9		
Extension media contact (Score)	0-33	4-24	Low (up to 11)	34	48.6	11.63	4.18
			Medium (12-22)	35	50.0		

			High (above 22)	1	1.4		
Organizational participation (Years)	Unknown	0-22	No (0)	23	32.9	3.21	4.52
			Low (1-7)	41	58.6		
			Medium (8-15)	3	4.3		
			High (above 15)	3	4.3		
Knowledge on hatchery management (Score)	0-30	15-26	Low (up to 10)	0	0	20.04	2.45
			Medium (11-20)	39	55.7		
			High (above 20)	31	44.3		

SD\* = standard deviation; BDT = Bangladeshi Taka

Education has been found as a vital factor that influences management and adoption of technologies (Hossain, 2017; Rahman, 2014). Education plays a significant role in enabling the hatchery owners' understanding of technicalities within the instruments as well as problems resolution. The highest proportions (38.6%) of the respondents had medium farm size, followed by small (35.7%). The majority of the hatchery owners reported their level of income was high (94.3%) and most of the respondents (44.3%) did not have access to credit. A large majority of the hatchery owners (72.8%) have low experience in hatchery management while only a few have high experience (2.9%). Experience in hatchery management plays a significant role in fish fry production and marketing (Jahangir, 2014). The highest proportions (75.7%) of the respondents had high investment for hatchery management during fish fry marketing. The majority of the respondents (35.7%) did not get any training on hatchery management. However, considerably high proportions (32.4%) of the respondents have received more than 20 day long training. Training enhances hatchery owners' capability to manage hatchery skillfully. Hatchery owners with frequent access to training are more likely to resolve hatchery management issues. The findings showed that 50% of the respondents had medium extension contact followed by low contact (48.6%). The findings indicated that more than half of the respondents (58.6%) reported low organizational participation, followed by no organizational participation (32.9%). According to the score of the respondents, more than half of the hatchery owners (55.7%) have medium knowledge on hatchery management, followed by high knowledge (44.3%). The finding clearly pointed out that hatchery owners in the study area have sufficient knowledge on fish farming. Although the hatchery owners were knowledgeable, this study identified several problems of the hatchery owners in fish fry marketing in the study area.

### The extent of problems in fish fry marketing

The computed problem facing score of the hatchery owners was ranged from 12 to 27 with an average of 19.81 and standard deviation 2.86. Based on the observed scores, the distribution of the respondents has been presented in Table 2. The data presented in Table 2 reveal that the highest proportion of the respondents (95.7%) faced medium problems, while 2.9% and 1.4% of them faced high problem and low problem in marketing fish fry, respectively.

**Table 2** Categorization of respondents on the basis of their overall problems in marketing fish fry

Score Range		Respondent (n = 70)			Mean	SD
Possible	Observed	Category	Number	Percent		
0-36	12-27	Low (up to 12)	1	1.4	19.81	2.86
		Medium (13-24)	67	95.7		
		High (above 24)	2	2.9		

For determining the extent or severity of individual problem, rank order was made computing Problem Facing Score (PFS). According to the rank order of the 12 selected problems shown in Table 3, the top three problems with highest score have been described here.

Data presented in the Table 3 show that 'High cost of labor' got the highest score (187) and hence was considered as the 1<sup>st</sup> ranked problem. A large number of laborers are required for proper management of fish fry during production and marketing. But it was too costly to hire the laborer in the study area. As a result, the hatchery owners become discouraged in marketing fish fry and thus, they took it as major problem. A study conducted by Hemal *et al.* (2017) identified 'high labour cost' as one of the major problems in fish fry marketing in Sylhet, Bangladesh which supports the finding of the present research. The problem 'High transportation cost' got the 2<sup>nd</sup> highest scores (175) and hence considered as the 2<sup>nd</sup> ranked problem. Poor transportation facilities

and high transportation cost were also identified as some of the major problems of fish fry marketing in Sylhet District of Bangladesh (Hemal *et al.*, 2017). Similar result was found in a study conducted by Ali *et al.* (2010) where poor technical knowledge and improper transportation system were clearly documented as major problems in fish fry business. The study area of the present research was away from the highway. Therefore, the hatchery owners had to invest more during transportation for marketing the fish fry to the middleman or fish farmers. The problem 'Labor crisis' got the 3<sup>rd</sup> highest scores (142) and ranked as 3<sup>rd</sup> most important problem which is also relevant to the first ranked problem. Unavailability of the experienced laborer during production and marketing of fish fry was a prominent problem in the study area. It is important to note that, the fry mortality is ranked as a last problem in the study area of present research. However, high fry mortality was identified as major problem in some other region of the country i.e. high fry mortality due to disease (Sharif & Abdullah-Al-Asif, 2015) and improper transportation system in Jessore region in Bangladesh (Ali *et al.*, 2010).

**Table 3** Rank order of the selected problems faced by the hatchery owners in fish fry marketing (n = 70)

Problems	Extent of problems				PFS	Rank order
	High (3)	Medium (2)	Low (1)	Not at all (0)		
High cost of labor	48	21	1	0	187	1
High transportation cost	39	27	4	0	175	2
Labor crisis	6	60	4	0	142	3
Transportation distance	3	50	16	0	125	4
Transportation facility	0	47	20	3	114	5
Poor infrastructure	0	41	29	0	111	6
Lack of oxygen facility	0	29	39	2	97	7
Lack of proper packaging of fish fry	0	27	42	1	96	8
Poor knowledge on market price	0	28	39	3	95	9
Poor knowledge on market demand	0	19	49	2	87	10
Poor knowledge on proper transportation	0	17	52	1	86	11
Mortality of fish fry	0	3	67	0	73	12

PFS = Problems Facing Score

#### Relationships between problems faced by the hatchery owners in fish fry marketing and their selected characteristics

In order to determine the relationship between problems faced by the hatchery owners and their selected characteristics, Karl Pearson's Product Moment Correlation coefficient (r) analysis was conducted. The results of correlation analysis have been shown in Table 4. From the table 4, it could be revealed that the negative significant correlation of farm size with the problem faced by the hatchery owners in fish fry marketing clearly pointed out that the hatchery owners having large sized farm can minimize the undesirable loss during fish fry marketing. Sheheli *et al.* (2019) found similar relationship between the concerned variables.

**Table 4** Result of correlation analysis between explanatory variables and focus variable (n=70)

Focus variable	Explanatory variables	Correlation coefficient (r) with 68df	Tabulated values of r with 68 df	
			0.05	0.01
Problems faced by the hatchery owners in marketing fish fry	Age	-0.135	0.196	0.257
	Level of education	-0.190		
	Family size	0.126		
	Farm size	-0.275*		
	Annual income	-0.111		
	Access to credit	-0.211		
	Hatchery management experience	-0.355**		
	Total investment at hatchery	-0.370**		
	Training on hatchery management	0.195		
	Extension media contact	0.613**		

	Organizational participation	-0.098		
	Knowledge on hatchery management	-0.227		

Notes: df = Degrees of freedom, \*\*Correlation is significant at the 0.01 level of confidence, \*Correlation is significant at the 0.05 level of confidence

Hatchery management experience showed a negative significant relationship with the problem faced by the hatchery owners in fish fry marketing. This finding indicated that with the increase of the hatchery management experience of the hatchery owners, the problems in fish fry marketing decreases. Experience enables the hatchery owners to understand the hatchery conditions and different difficulties in fish fry marketing. Similar relationship was observed by Islam *et al.* (2013). The negative significant relationship between total investment at hatchery and problem faced by the hatchery owners in fish fry marketing indicated that when hatchery owner increases total investment at hatchery, problems in fish fry marketing decreases. There was a positive significant relationship between the extension media contact and problem faced by the hatchery owners in fish fry marketing. It implies that fish fry market related information those are received from various media might be wrong, misunderstood or not suitable with the issues of concerns of the hatchery owners and thus cause further problems in fish fry marketing. Besides, respondents might not receive correct message due to noise of the media which may end up with creation of new problem(s). Haque *et al.* (2019) found similar relationship between the concerned variables.

### Factors associated with the problems of the hatchery owners in fish fry marketing

Multiple linear regression analysis was carried out to determine the factors and their relevance in predicting the focus variable, i.e., the problems in fish fry marketing. Table 5 represents a summary of the multiple linear regression analysis. The findings showed that two variables (Extension media contact and Knowledge on hatchery management) out of twelve were significant with the F value of 6.232 and  $R^2$  of 0.476. The  $R^2$  value indicated that 47.6% percent of the total variation of the problems in fish fry marketing was explained by the two variables included in the regression analysis.

**Table 5** Summary of multiple linear regression explaining the focus variable (n = 70)

Independent variable	Unstandardized coefficients		Standardized coefficients	t	Sig. B
	B	Std. Error	Beta		
(Constant)					.000
Age	.028	.050	.067	.568	.572
Level of education	-.086	.093	-.096	-.922	.360
Family size	.145	.122	.146	1.192	.238
Farm size	-.159	.084	-.304	-1.882	.065
Annual income	.318	.195	.223	1.627	.109
Access to credit	.481	.578	.142	.833	.408
Hatchery management experience	-.063	.084	-.109	-.750	.456
Total investment at hatchery	.011	.229	.008	.047	.962
Training on hatchery management	.010	.008	.141	1.358	.180
Extension media contact	.398	.078	.581	5.079	.000
Organizational participation	.007	.059	.012	.125	.901
Knowledge on hatchery management	-.476	.165	-.407	-2.880	.006
Adjusted $R^2$ = 0.476		F-value = 6.232			

Significant if  $p < 0.05$ , Level of significance = 95%

The coefficient of extension media contact (0.398) was positive and significant in predicting the variation of problems in fish fry marketing, indicating that the hatchery owners gain necessary information on fish fry marketing by contacting with extension media. Thereby, the hatchery owners' extension media contact is important influential factor which can explain the variation of problems in fish fry marketing. The coefficient of knowledge on hatchery management (-0.476) in fish fry marketing of the hatchery owners was negative and significant in predicting the problems. These findings revealed that with an increase in knowledge on hatchery management, the hatchery owners were found to have fewer problems in fish fry marketing. This may indicate that increased



knowledge in hatchery management helps hatchery owners explore alternative ways to lessen the impact of a problem. Pandit and Basak (2013) reported similar findings.

### Step-wise multiple regression analysis

To understand the individual contribution of the extension media contact and knowledge on hatchery management in predicting the variation of the problems in fish fry marketing, a step-wise multiple regression analysis was conducted. Table 6 represents the summary of step-wise multiple regression analysis.

**Table 6** Summary of step-wise multiple regression analysis (n = 70)

Model	Variables entered	Multiple R	Multiple R <sup>2</sup>	Variation explained	Significance level
Constant + X10	Extension media contact (X10)	.613	.376	37.6	.000
Constant + X10+ X12	Knowledge on hatchery management (X12)	.676	.457	45.7	.000

The findings indicated that extension media contact ( $R^2 = 0.376$ ) was the first variable to enter into the step wise multiple regression model and explained (37.6%) of the variation, indicating that hatchery owners having more extension media contact face lower problems in marketing fish fry. The second variable entered into the model was knowledge on hatchery management ( $R^2 = 0.457$ ) in marketing fish fry which explained the variation (45.7%) of the problems identified in marketing fish fry. This findings showed that the more knowledge on hatchery management of the hatchery owners, the more likely they are to face fewer problems in marketing fish fry. According to Faruk (2017), farmers involved in farming for a significant period of time are better able to expect their farm production, certain scenarios, and have more access to farm-related knowledge.

## 4. CONCLUSION

The study identified various problems of the hatchery owners in Mymensingh region of Bangladesh where fish fry marketing is a common practice to meet increasing demand of fish fries. Results revealed the degree of severity (or extent) of each selected problem of the hatchery owners in the form of 'rank order of the problems' by computing the problem facing score. The findings showed that the majority of the hatchery owners (95.7%) faced medium problems in marketing fish fry. Among 12 identified problems, high cost of labour, high transportation cost, and labour crisis were significant and ranked as first 3 major problems in fish fry marketing. This is important to note that these major problems have little to do with traditional extension advisory services because the problems are mostly about economic condition of the individual hatchery owners and labour force orientation in the area. Hence, the local extension bodies for fisheries development should seek innovative solution such as labour saving techniques and community based organization of support groups (or common interest group, CIG) who might organize themselves in a cooperative to find cheap and safe option to transport the fish fries in the markets. The study also identified some technical problems related to fish fry marketing such as lack of oxygen, improper packaging of fish fry, lack of knowledge on safe transportation, mortality of fry etc. To minimize these problems the local extension providers should organize training and provide necessary knowledge to the hatchery owners in time of their need. On the other way, Department of Fisheries (DoF) and other related organizations can offer necessary funds, micro-credit facilities for resource poor hatchery owners and training for all types of the hatchery owners to overcome the problems and ensure timely supply of fish fries in the markets. The study also identified influential factors i.e. extension media contact and knowledge on hatchery management those affect the hatchery owners' problems in fish fry marketing. Thus, it can be concluded that these two factors may be considered by the policy makers while taking plan in this regard.

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### Author Contributions

Arup Kumer Das contributed to all the research activities including proposal formulation, design, data collection and analysis under the continuous supervision of Mohammed Nasir Uddin and Md. Asaduzzaman Sarker. Most Zannatun Nahar Mukta prepared the



article through writing, editing, interpretations of the results and reviewing secondary literature to make the article concise and informative and Md Nur Alom Sarkar Mithun greatly contributed to editing, literature searching and the interpretation of the results.

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The authors declare that there are no conflicts of interests.

#### Peer-review:

External peer-review was done through double-blind method.

#### Data and materials availability:

All data associated with this study are present in the paper.

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